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«Plattenkalk» of the Lower Cretaceous (Albian) of Petina, in the Alburni Mounts (Campania, S Italy), and its decapod crustacean assemblage

Abstract – A new fossil fishes level of a Plattenkalk type is reported, in facies of anoxic lagoon, in the carbonatic platform Mesozoic sequence outcropping in the Alburni Mountains massif (Campania Apennine, S Italy). The plattenkalk is ascribed to the Middle Albian (Lower Cretaceous) on the basis of the micropalaeontological analysis of the microfossiliferous layers at its bed and top. The macroflora consists of Conifers such as *Pagiophyllum* sp., *Podozamites*? sp. and Bennettitales such as *Zamites* sp., while the macrofauna is represented by decapod crustaceans and fishes among which *Coelodus* sp., *Lepidotes* sp., *Prochlanos* sp. and *Clupavus* sp.. This first report contains the results of the taxonomic study of decapod crustaceans found until present in the fossiliferous outcrop. The study of the small sample of macruran and brachyuran decapod crustaceans brought to the description of the new genus *Alburnia* with the species *Alburnia petinensis* n.sp. (infraorder Caridea Dana, 1852, family Palaemonidae Rafinesque, 1815). A few specimens have been ascribed to the genus *Palinurus* Weber, 1795 with *Palinurus* sp. (infraorder Palinura Latreille, 1803, family Palinuridae Latreille, 1802). One single specimen has been ascribed to the family Portunidae Rafinesque, 1815 (genus and species indeterminate). Until present the Italian knowledge on macruran decapod crustaceans has been based on several Triassic, Jurassic and rarely Cretaceous faunistic assemblages, found in the Alps during the last ten years. Therefore the discovery of macruran decapod crustaceans at Petina, together with those of Pietraroia (Benevento, S. Italy; see paper on the same volume), plays a particularly important role, since it is the only report on Cretaceous decapod crustaceans outside the Alps.

Riassunto – Il «plattenkalk» del Cretacico inferiore (Albiano) di Petina, nei Monti Alburni (Appennino Campano), e la sua fauna a crostacei decapodi.

Viene segnalato un nuovo orizzonte ittiolitifero del tipo Plattenkalk, in facies di laguna anossica, nella successione mesozoica di piattaforma affiorante nel massiccio dei Monti Alburni (Appennino Campano, S. Italia). Il plattenkalk viene attribuito all'Albiano medio (Cretacico inferiore) sulla base dell'analisi micropaleontologica degli strati microfossiliferi presenti al letto ed al tetto di esso. La macroflora è costituita da Conifere quali *Pagiophyllum* sp., *Podozamites* ?sp. e Bennettitidi quali *Zamites* sp., mentre la macrofauna è rappresentata da crostacei decapodi e pesci tra cui *Coelodus* sp., *Lepidotes* sp., *Prochlanos* sp. e *Clupavus* sp.. In questa prima nota vengono riportati i risultati dello studio tassonomico dei crostacei decapodi finora rinvenuti nel giacimento fossilifero. Lo studio del piccolo campione di crostacei decapodi macruri e brachiuri ha portato alla descrizione del nuovo genere *Alburnia* con la specie *Alburnia petinensis* n.sp. (infraordine Caridea Dana, 1852, famiglia Palaemonidae Rafinesque, 1815). Alcuni esemplari sono stati attribuiti al genere *Palinurus* Weber, 1795 con *Palinu-*

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Fig. 2 – NE side of Alburni Mounts, near the town of Petina (Salerno province). The position of the plattenkalk is indicated by a row of black circles.

ichthyofossils, subject of this paper, outcropping along the eastern side of the Alburni Mountains (Figs. 1, 2). The main subject of the work has been not only a first setting of vertebrates and other macrofossils found in the outcrop, together with the taxonomic study of decapod crustaceans, but also the precise chronostratigraphical setting of the fossiliferous horizons, through the micropalaeontological study in thin section of the microfossiliferous assemblages contained in the layers at the bed and top of the plattenkalk.

The taxonomic study of decapod crustaceans has been carried out by A. Garassino, while S. Bravi carried out the stratigraphical study and preliminary observations on the remaining fossil fauna and flora. Conclusions have been written in close co-operation between the authors.

The detailed dating of plattenkalk horizons, carried out also for other fossiliferous outcrops of Campania (Castellammare, Pietraroia, Profeti) (Bravi & De Castro, 1995, Bravi, 1995), will allow to better correlate the numerous outcrops in more or less anoxic lagoonal facies, often containing ichthyofossils, present both in the Apennines and in other sites of the Mediterranean basin, with an age between Barremian (Lower Cretaceous) and Cenomanian (Upper Cretaceous). This will contribute to a more detailed reconstruction of the palaeogeography of that period.

Geological setting

The Alburni Mountains monocline structure (I.G.M. sheet 198 - Eboli. 1:100.000) is a mountainous, regular-shaped arrangement following a WNW-ESE direction, gently leading SW. It is bordered by large perimetric faults and has subvertical walls. Two main systems of fractures following an Apennine and counter-Apennine direction cross its body.

The age of the outcropping carbonatic sequence is between Upper Jurassic and Upper Cretaceous. The latter is widely outcropping on the top of the massif. Over the Mesozoic ground represented by inner platform facies, there are small Eocene and Miocene outcrops, overlapping on Cretaceous. For a more detailed description of lithologies, biostratigraphy and geometric relationships among the outcropping grounds, see other papers (Sartoni & Crescenti, 1962, Bravi & Schiattarella, 1988, Santo, 1988).

Stratigraphical description of the sequence section including the Plattenkalk

The Mesozoic sequence section including the fossiliferous horizon outcrops along the NE side of the Alburni massif and can be accessed by a mule-track starting from Petina road - Sicignano degli Alburni and winding along the mountain side, reaching the top at a height of about 1300 m., by «Il Figliolo» cliff (I.G.M. sheet 198, I SE - Auletta; 1:25.000 (Figs. 1, 2). The examined stratigraphical interval (Fig. 3) is located between a height of 1120 m and 1180 m, and is about 60 m thick. The plattenkalk (fig. 4) is located in the lower half of the interval. The strata dip follows a SSW direction, with an angle of about 10°. From the bottom to the top it is possible to subdivide the interval in three main parts.

Lower Part «A» (between samples AL27 and AL20)

It consists of about 5 m of grey-coloured packstones and wackestones, with an average thickness of 60-70 cm, exceptionally over 1 m., lacking macrofossils but highly microfossiliferous. Weak dolomitisation phenomena are present, increasing toward the higher part of this stretch, by getting closer to the plattenkalk. In thin section it is often possible to observe abundant pellets and muddy intraclasts and bioclasts. The latter mainly consist of fragments of small turreted gastropods and requienid bivalves. Also ostracods are frequent. Certain horizons show small drying voids with geopetal infillings. Among algae *Thaumatoporella* sp. is frequent, and sometimes also *Boueina* sp. and the dasycladal *Salpingoporella turgida* Radoicic (Fig. 5c); a form similar to *Cretacicladus* is occasionally present. Foraminifers (Figs. 5a, b) are mainly represented by Miliolids (among which *Quinqueloculina* sp.), *Glomospira* spp.. Very abundant are «*Pseudonummoloculina*» sp., Textulariidae, *Sabaudia minuta* (Hofker), *Cuneolina* aff. *pavonia* D'Orbigny, *Praechrysalidina infracretacea* Luperto Sinni, Lituolids, Orbitolinids, among which *Orbitolinopsis* gr. *reticulata* Moullade & Peybernes and *Paracoskinolina tunesiana* Peybernes.

This stretch of the sequence can be ascribed to the late Lower Albian (*Sabaudia minuta* zone; De Castro, 1991), especially for the presence of the index species linked to *Salpingoporella turgida* (Barattolo & De Castro, 1991) and to the orbitolinids *Paracoskinolina tunesiana* and *Orbitolinopsis* gr. *Reticulata* which, in southern Apennines, are very abundant in horizons located a few meters above the *Ovalveolina reicheli* De Castro layers (Bravi, pers. rem.), which first appearance marks the early Albian. Also the abundance of «*Pseudonummoloculina*» sp. and of evolved Cuneolines is consistent with the ascribed age.

The deposition environment can be identified with a relatively open neritic area (packstones with infrequent micrite), with detritic sedimentation,

THE SAMPLED SEQUENCE IN THE
ALBURNI MOUNTAINS, INCLUDING THE
PLATTENKALK OF PETINA

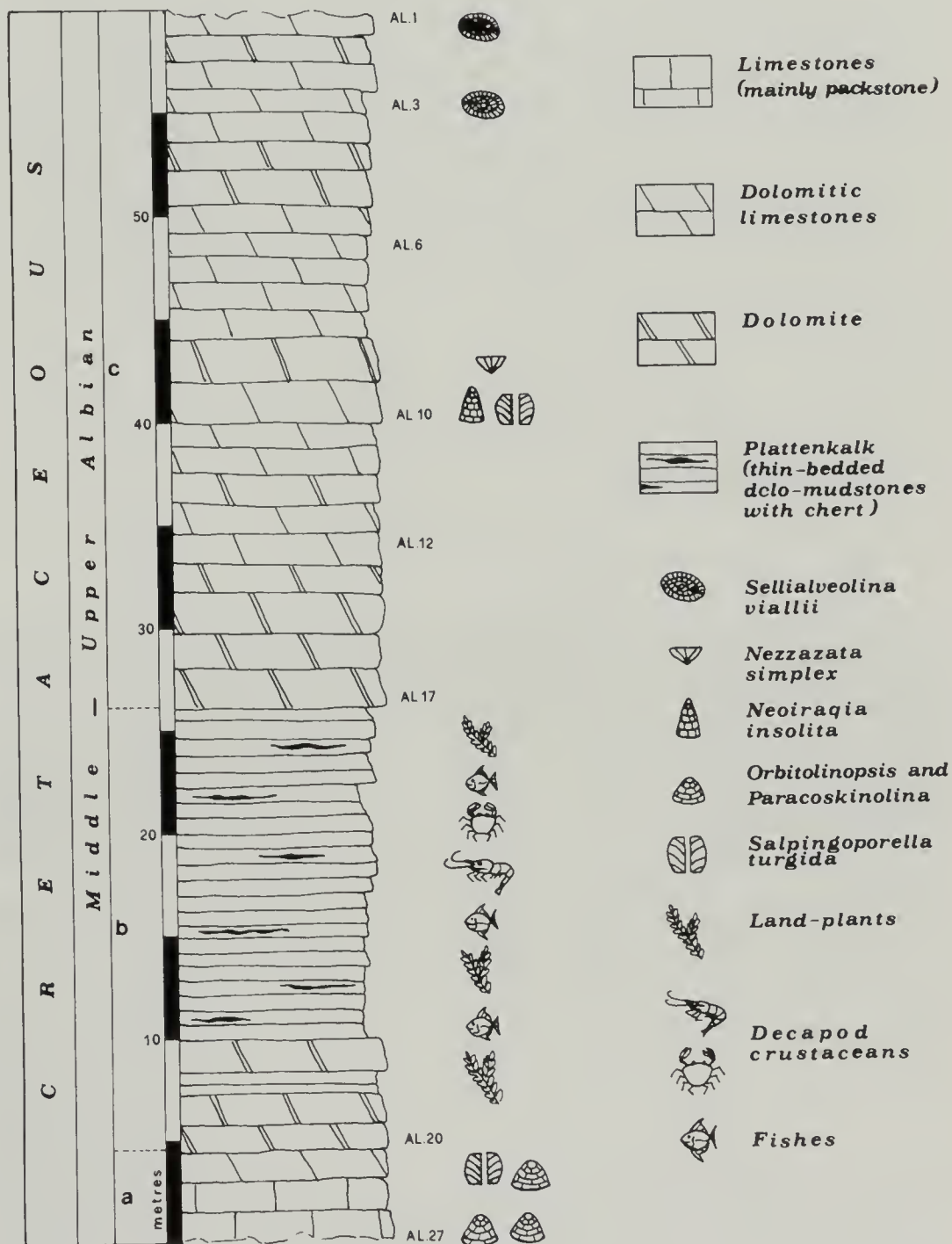


Fig. 3 – Stratigraphical column of the sequence stretch including the plattenkalk.

partly organogenic, sometimes exposed to supratidal conditions (particularly wide tide excursions?), proven by drying voids with geopetal silt infillings.

Middle Part «b» (between samples AL20 and AL17): the plattenkalk

The basal part of this stretch consists of about 4 m of slightly marly, whitish and greyish, crystalline dolomite, in layers up to 50-60 cm thick, with ipidiotypical and xenotypical structures, alternated to often marly and laminated dolomitic limestones in thin layers, representing the first intervals with the typical plattenkalk facies. These layers are followed by 15-16 m of dolomitic limestones and dolomite in thin and even layers, with infrequent havana-coloured, blackish and greyish cherty nodules, often thinly laminated and marly, with remains of continental flora and small fishes, especially frequent in the lower part. Also macruran decapod crustaceans and bigger-sized fishes, both complete and disarticulated, are present in the upper part of the plattenkalk, together with scattered scales and coprolites.

The plattenkalk can be observed laterally for 200 m along the mule-track, but its lateral connections with the embanking rocks are not visible, because of the covering ground which, except in the track, almost completely hides the rocky substrate. The thin sections of the dolomitic layers of the lowest part of this interval consists of crystalline, often very fine-grained dolomite, still preserving small areas with the original mudstone or wackestone. No microfossils can be recognised: if they were originally present, they have been completely obliterated by rock recrystallisation. The thin sections (Fig. 6c) of the thinly laminated layers of the plattenkalk often shows the regular sequence of small sedimentary layers a few centimetres

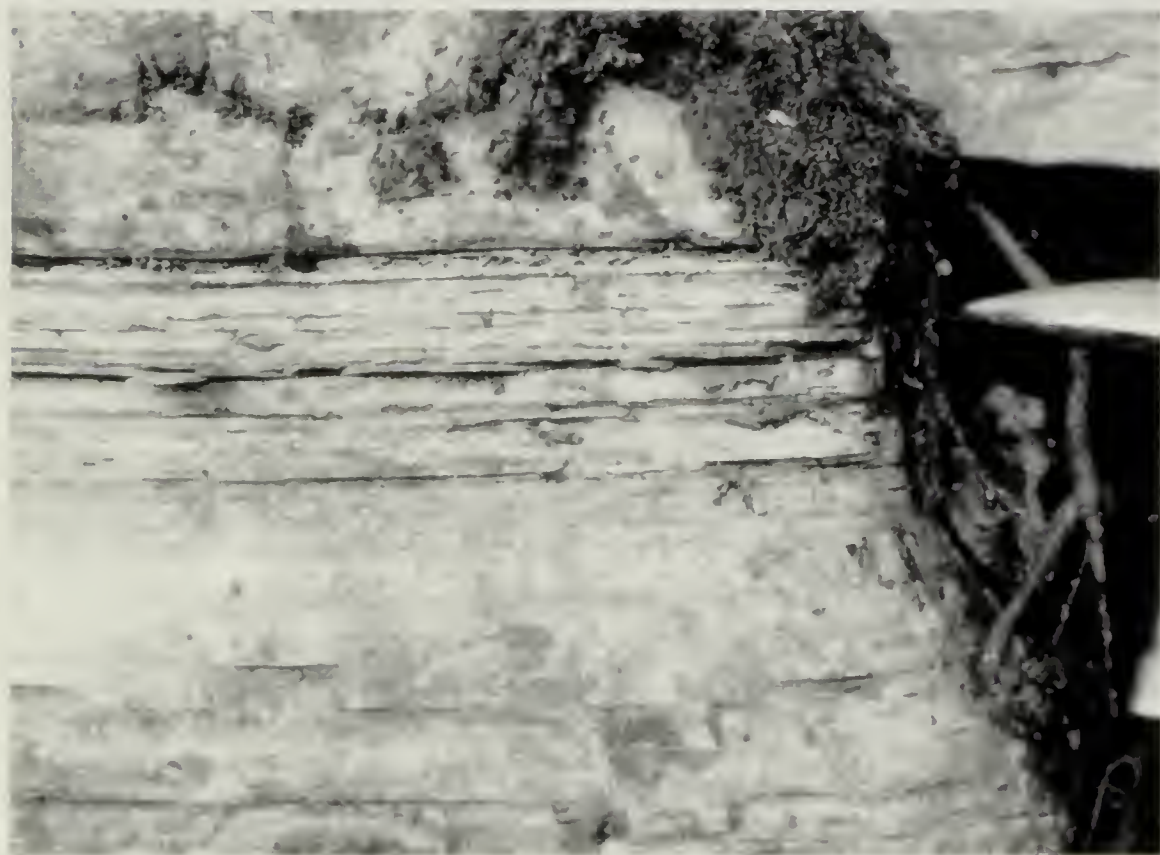


Fig. 4 – Petina plattenkalk: the thinly laminated fossiliferous layers.

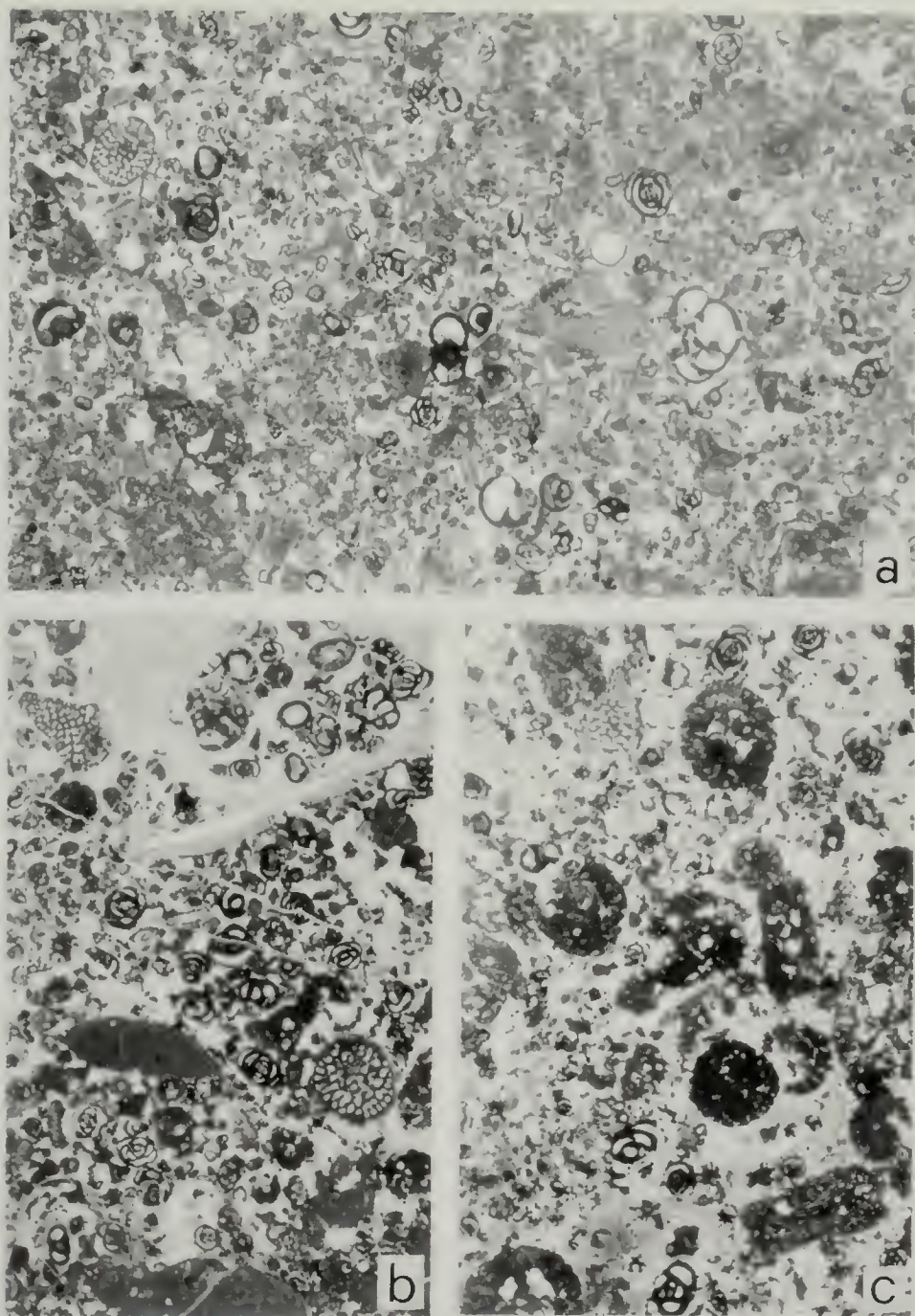


Fig. 5 – a) Packstone-grainstone with miliolids, «*Pseudonummoloculina*» sp., textulariids, *Praechrysalidina infracretacea*, *Orbitolinopsis* gr. *Reticulata*, *Thaumatoporella* sp., *Glomospira* spp., *Cuneolina* aff. *Pavonia*, *Sabaudia minuta*, *Paracoskinolina tunesiana*, *Boueina* sp. are also present in the association, but they are not visible in the photo. Thin section: AL25.1.
 b) Grainstone-packstone with intraclasts, fragments of bivalves, requienids and gastropods, foraminifers such as miliolids, «*Pseudonummoloculina*» sp., *Cuneolina* aff. *Pavonia*, *Praechrysalidina infracretacea*, *Sabaudia minuta*, *Orbitolinopsis* gr. *Reticulata* and *Paracoskinolina tunesiana* (Not all of these forms are visible in the photo). Thin section: AL23.
 c) Packstone with dolomitic matrix, with algae and foraminifers such as *Salpingoporella turgida*, *Boueina* sp., miliolidae, *Glomospira* spp., «*Pseudonummoloculina*» sp., *Cuneolina* aff. *Pavonia*, *Praechrysalidina infracretacea*, *Sabaudia* sp., *Orbitolinopsis* gr. *Reticulata* and *Paracoskinolina tunesiana* (Not all of these forms are visible in the photo). Thin section: AL22. For all the illustrations: layers located immediately below Petina plattenkalk. Lower-Medium Albian (x11).

thick, consisting of micritic material containing very rare and tiny foraminifers (mainly miliolids), together with crystalline carbonatic particles, still very fine, part of which can probably be ascribed to fragments of bivalve shells, with a likely undetermined organogenic origin. These sedimentary small layers often have a finely graded structure and contain ostracod shells with very thin and flat carapace, at times quite abundant. Sometimes small lenses of coarser detritic material are contained between two sedimentary layers. Fossil remains are generally located at the top of the small layers.

The absence of microfauna does not allow to make precise chronostratigraphical conclusions for this interval. But its stratigraphical position, immediately following the previous horizons of the Lower Albian, allows to ascribe it to the Middle Albian. This conclusion is supported also by microfaunas present in the following stretch of the stratigraphical series (see below: Upper Part «c»).

The deposition environment of the plattenkalk can be identified with a markedly restricted lagoon, which water was probably almost constantly stratified and lacking oxygen at the bottom (no signs of activity of benthonic organisms or bioturbation can be observed, and the rock is mainly dark-coloured, bituminous and fetid when hammered). Some of the animal organisms found in the outcrop, such as decapod crustaceans, ostracods and probably certain fishes, could live in the most superficial water layer of the lagoon, maybe connected to less distal areas of the bottom. The sedimentary structure with thin fine-graded horizons (deposition by decantation and microturbiditic mechanisms) of the plattenkalk layers seems to suggest that sediment supplies had to be due mainly to the sweeping of adjoining muddy sedimentation areas by scarcely hydrodynamic waves, and probably to «slump» mechanisms occurring in the marginal areas of the lagoon, which could originate small turbidite currents.

The presence of abundant remains of continental macroflora (Figs. 6a, b) and of ostracods with flat and thin carapace, typical of low-salinity lagoonal environments, prove the existence of overlooking lands above the sea-level, where fresh water areas could exist, at least occasionally connected to the lagoon.

Upper Part «c» (between samples AL17 and AL1)

It consists of about 35 m of dolomite, mudstones, wackestones and rare packstones, in 50-60 cm thick layers on an average, but also in 2 m thick, badly stratified, light-coloured banks, sometimes unevenly laminated and stromatolitic. Calcareous lithotypes are often strongly dolomitised, sometimes completely recrystallised (Fig. 7b) and fractured. In thin section, especially in the first 4-5 m just above the plattenkalk, it is possible to frequently observe loferitic limestones with drying voids (*fenestra*) and sometimes vertical voids due to bioturbation, with geopetal infillings (Fig. 7a). Microfossils are often abundant, consisting of ostracods (Fig. 8a), fragments of small gastropods and bivalves, algae and several foraminifers. Among algae *Thaumtoporellae* (Fig. 9a) are frequent, while the dasycladal *Salpingoporella turgida* (Fig. 9b) is present only in the middle part of the interval.

Foraminifers are represented by Miliolids (among which *Quinqueloculina* sp.), *Glomospira* spp., «*Pseudomunimoloculina*» sp., Textulariids, *Cuneolina pavonia*, *Praechrysalidina infracretacea*, *Neoiraqia insolita* (Decrouez &

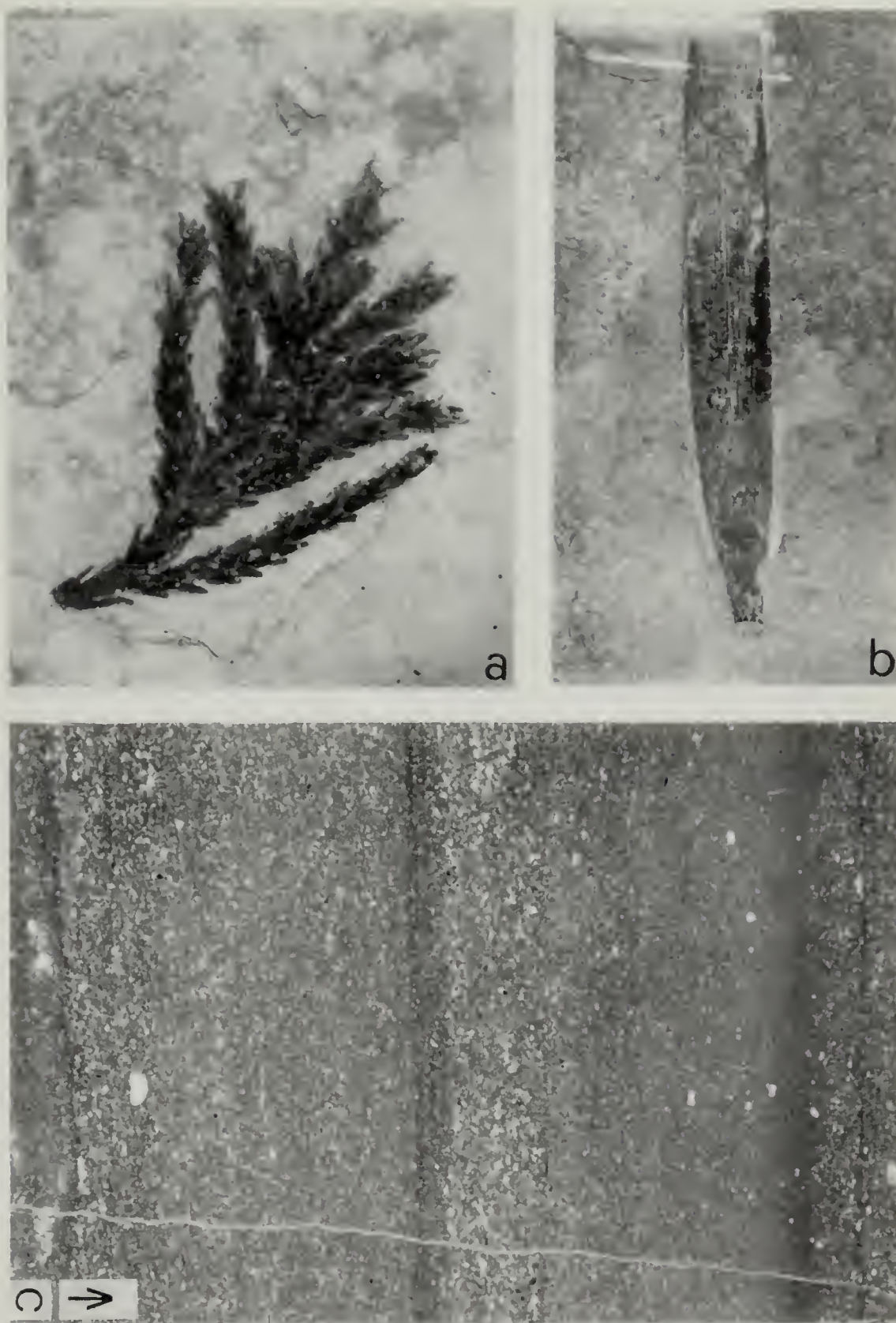


Fig. 6 – a) *Pagiophyllum* sp., M21844 (x1.5); b) *Zamites* sp., M21845 (x1.3). Petina Plattenkalk, Middle Albian. c) thin graded horizons containing rare ostracods, small foraminifers and fine organogenic particulate. Petina Plattenkalk. Thin section: PT1. Middle Albian. (x11). The arrow indicates the stratigraphical versus.

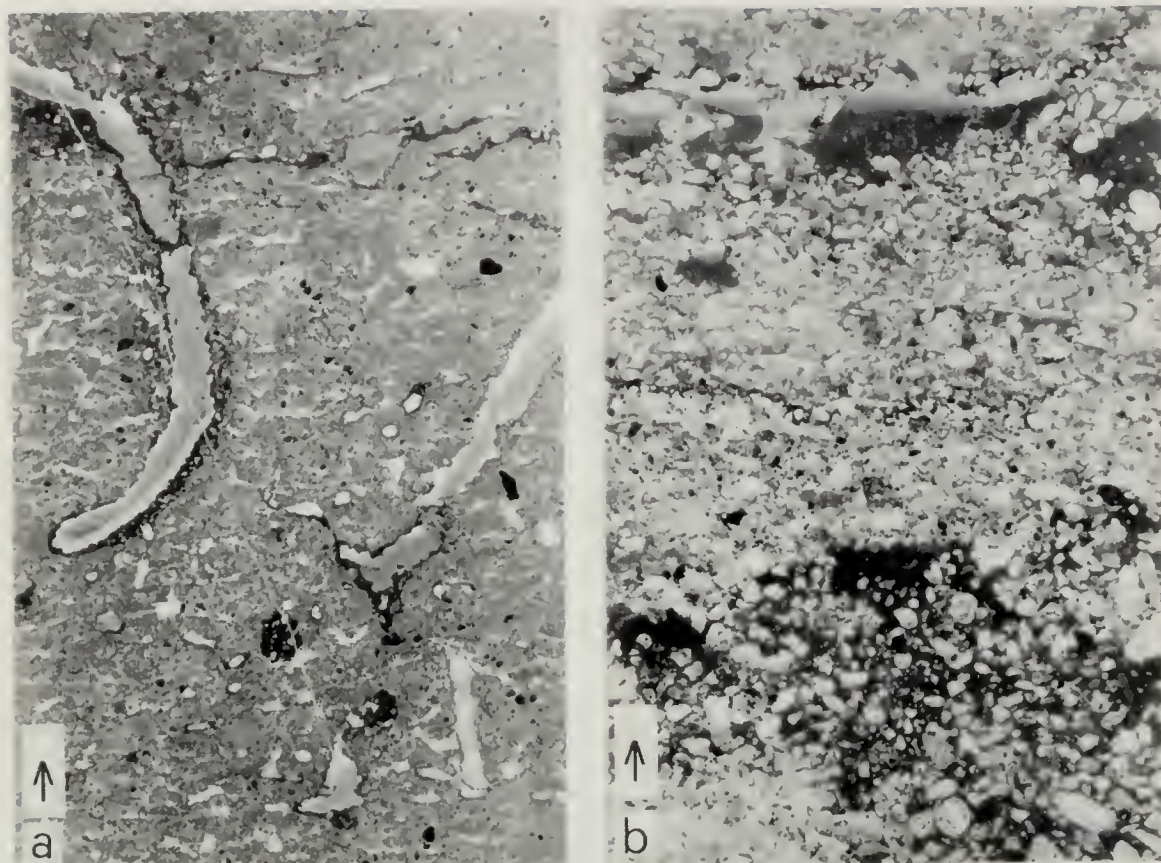


Fig. 7 – a) Dolomitised wackestone with loferitic structure and bioturbation vertical voids, often filled by geopetal silt. Thin section: AL14; b) Strongly recrystallised packstone, with geopetal structures. Thin section AL15. For both illustrations: layers overlooking *Petina* plattenkalk. Upper Albian. (x7). The arrow indicates the stratigraphical versus.

Moullade), *Nezzazata simplex* Omara, *Sellialveolina viallii* Colalongo. Among the latter forms, *Neoragia insolita* (Fig. 9c) and *Nezzazata simplex* appear about 15 m over the ichthyolytic levels (sample AL10; Fig. 3), while *Sellialveolina viallii* (Fig. 8b) is present in the last layers of this stretch of the succession (samples AL3 and AL1; Fig. 3).

The age of the examined stratigraphical interval can be mainly deduced by the presence of the orbitolinid *Neoragia insolita*, together with *Nezzazata simplex*, as well as the subsequent appearance of *Sellialveolina viallii*. This association is typical of the Upper Albian-Lower Cenomanian (*Peneroplis parvus* zone) (De Castro, 1991).

The deposition environment of the lower part of this interval can be identified with an intertidal area frequently exposed to drying periods (loferitic structures, drying and bioturbation voids, at times with geopetal infillings, strong recrystallisation of the rock). This environment evolves upward to more marked subtidal marine conditions, in quite limited lagoonal facies, more suitable for the development of benthonic life (abundance of foraminifer microfaunas).

General conclusions on the sedimentary and environmental evolution of the examined stretch of the sequence

In 1962 Sartoni & Crescenti reported the presence in the north-western side of the Alburni Mountains of « calcari neri, omogenei, a grana finissima,

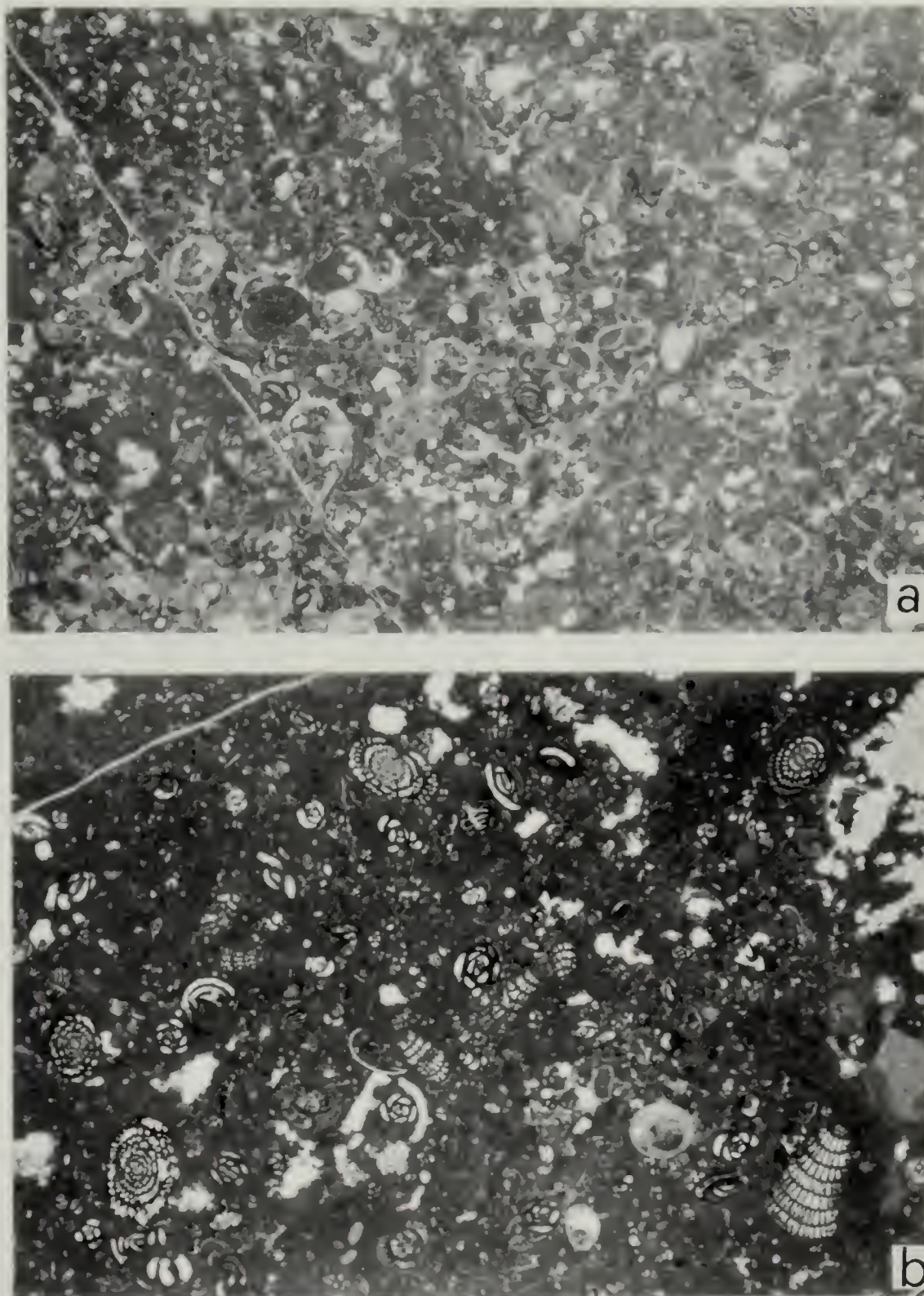


Fig. 8 – a) Packstone with ostracods. *Glomospira* spp. and «*Pseudonummoloculina*» sp. are also present, but not visible in the photo. Thin section: AL7 (x20).
 b) Wackestone with *Sellialveolina viallii*, *Cuneolina pavonia*, miliolids and ostracods. Thin section: AL1 (x16). For the both illustrations: locality: Alburni Mountains, strata: above the plattenkalk, age: Upper Albian?-Lower Cenomanian.

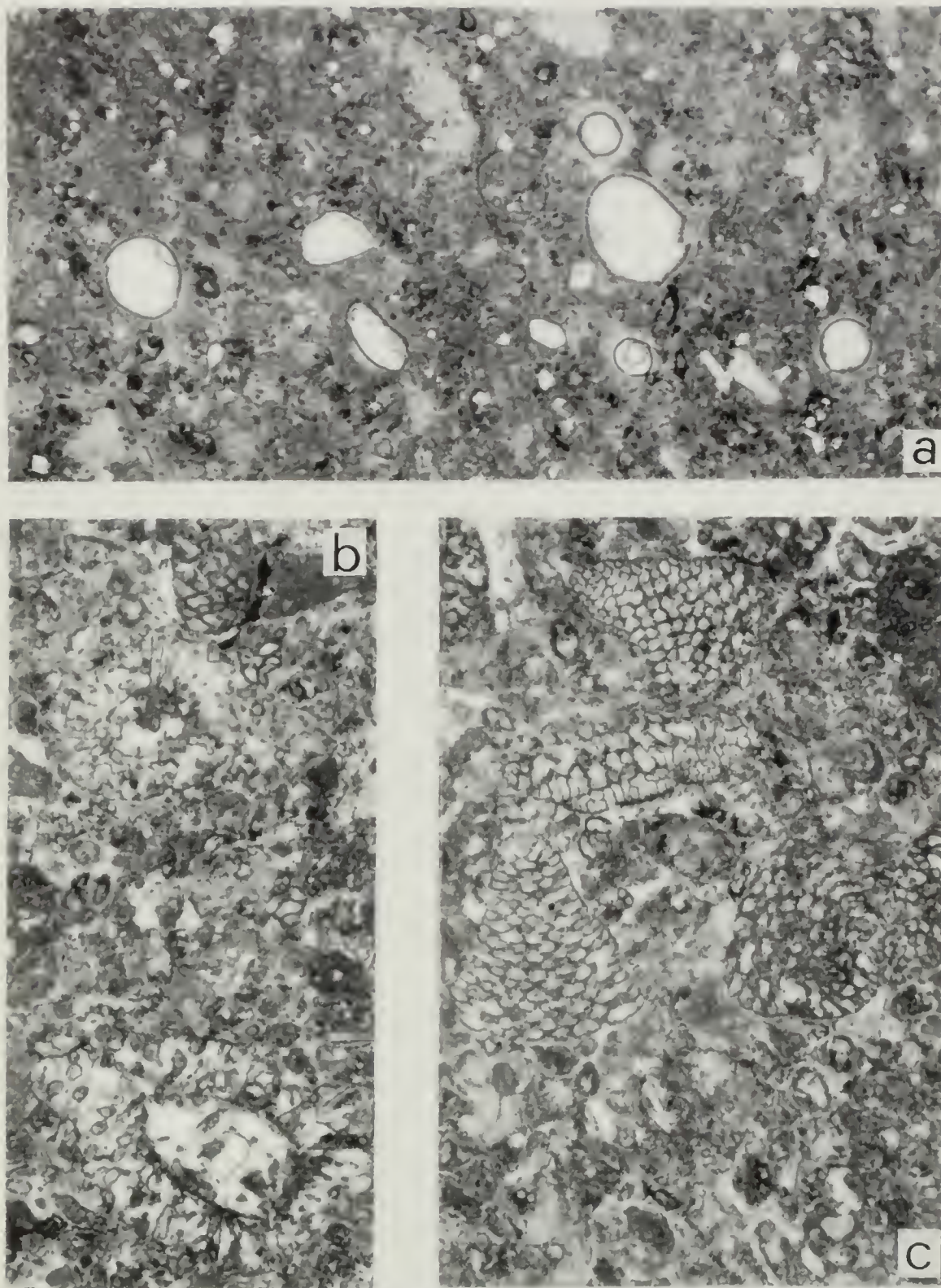


Fig. 9 – a) Wackestone with *Thaumatoporella* sp., *Praechrysalidina infractetacea*, ostracods with thin and smooth carapace and bivalves of a «filament type» are also present in the association, but they are not visible in the photo. Thin section: AL12. (x22).

b) Packstone with *Salpingoporella turgida* and *Neoiragia insolita*. Fragments of requienids, miliolids, textulariids, *Cuneolina pavonia*, *Praechrysalidina infractetacea* and *Nezzazata simplex* are also present in the association, but they are not visible in the photo. Thin section: AL10. (x22).

c) Packstone with *Neoiragia insolita*. The same forms of the previous illustration are also present in this association, but they are not visible in the photo. Thin section: AL10.1. (x28). For all the illustrations: layers overlooking Petina plattenkalk. Upper Albian.

coerenti, sottilmente, stratificati in straterelli di 5-30 cm di spessore, con frammenti ittiolitici indeterminabili «. The authors ascribed these limestones to their «Cuneolina pavonia parva zone» (Albian-Cenomanian). The plattenkalk, subject of this study, certainly represents the lateral continuation of the facies reported by the above-mentioned authors. Therefore such facies does not seem to be limited to a small-sized basin within that area of the carbonatic platform, during the Middle Albian. On the contrary it is possible that markedly restricted lagoonal conditions and stagnant basins were common, and widely extended at the above-mentioned stratigraphical height in the Alburni monocline structure.

The examined stratigraphical interval represents on the whole the evolution of a platform area from a relatively open neritic environment (Lower Part «a») to a markedly restricted subtidal lagoonal environment, with stratified water, almost completely lacking oxygen at the bottom and with very poor exchanges with the open sea (Middle Part «b»: Plattenkalk). The latter environment, probably very shallow and overlooking lands above the sea-level (abundance of remains of continental flora and ostracods typical of low-salinity environments) evolves to an upper subtidal-intertidal (Upper Part «c»), proven by the frequency of loferitic structures of the rocks, the porosity due to drying up, geopetal infillings and marked recrystallisation of materials. Finally the last stretch dwells a relatively restricted lagoonal environment (wackestones and packstones with abundant micrites and benthonic foraminifers).

The above-mentioned stratigraphical sequence can be interpreted as a wide peritidal cycle of a «shallowing upward» type, probably linked to eustatic changes of the sea level. Such cycle established in an area of the platform which morphology, probably flat and with weak depressions, could support the formation of isolated lagoons, where plattenkalks sedimented.

Preliminary palaeontological observations on fauna and flora of the Plattenkalk

The first palaeontological observation on the fossils of the plattenkalk are herewith reported. Only decapod crustaceans are studied into details by one of the authors (A. Garassino). The detailed study of the ichthyofauna will be the subject of a later report by one of the authors (S. Bravi).

The fossiliferous material found until now at Petina plattenkalk is the result of several, although occasional, excursions and not of a systematic excavation. Such excavation is planned for the near future, and it will allow to obtain a more complete framework of the fauna and flora of the outcrop.

I - Megaflora

Order Coniferales
Family Araucariaceae
Genus *Pagiophyllum* Heer, 1881

Pagiophyllum sp.

The fossil remains that can be ascribed to *Pagiophyllum* Heer are very abundant in the plattenkalk. They are represented by axes of conifers sometimes thickly branched, not flattened, bearing small suboval or elliptic lea-

ves, arranged in spirals. The free part of the leaves is longer than the width of the leaf pad. The latter feature allows a generic ascription, although the distinction between the genera *Brachyphyllum* Brogniart and *Pagiophyllum* Heer, based on the form of the leaves, is merely morphological. A taxonomic classification within a specific range will be available through cuticular studies, since the cuticle often seems to be in a good state of preservation in the examined material.

Family Podocarpaceae or Araucariaceae?
Genus *Podozamites* Brongniart, 1828

Podozamites? sp.

Up to now only one find of Petina plattenkalk is ascribed, with a few doubts, to this genus. It consists of a leaf 23 mm. long and slightly over 6 mm wide in the central part, with an elongate oval shape, markedly narrowing at the joint, forming a very short petiole with oblique base. The margins are flat. The distal extremity is rounded, but not perfectly symmetric. The leaf lamina is crossed by at least nine weak longitudinal nervations, parallel to each other and to the lateral margins and converging toward the leaf extremities. The general shape and the arrangement of the nervations correspond to those of the genus *Podozamites* Brongniart, even though the latter generally shows more marked longitudinal nervations.

Order Bennettitales
Family Bennettitaceae
Genus *Zamites* Brongniart, 1828

Zamites sp.

One single remain, which can probably be ascribed to this genus, has been found in the outcrop until now. It consists of a long lanceolate leaf, lacking the distal part, longitudinally crossed by seven main nervations, straight and parallel to each other and to the leaf margins. Among the main nervations there are thinner and straight secondary nervations. By getting closer to the leaf joint, the width of the leaf decreases and nervations converge, even though they do not originate a true petiole.

Indeterminate remains of plants

Some longitudinally striped frustules and stems with nodal points located at regular distances (2.5 cm between the nodes) have been found in the fossiliferous outcrop. For the moment it is not possible to classify them.

II - Pisciformes (Figs. 10a, b, c)

Order Pycnodontiformes
Family Pycnodontidae
Genus *Coelodus* Heckel, 1856

Coelodus sp.

This genus is presently represented at the Alburni Mountains by one single specimen in part and counter-part, lacking the head and the dorsal portion of the trunk, and by some isolated splenial and vomerine sets of teeth. Because of the incompleteness of the material, the generic ascription is based both on the features of the teeth and on the following features (Blot, 1987, Wenz, 1989), which can be observed in the above-mentioned incomplete specimen: 1) the bases of the neural and haemal arcs are rounded and they do not surround the notochord; 2) neural and haemal spines anteriorly expanded in a bony lamella with evenly arcuate or slightly undulate margin, without complex intervertebral articulation among consecutive elements; 3) slightly expanded last haemal and hypural fan-shaped spines; 4) the first segmented and dichotomous rays of the anal fin are elongate, the following ones rapidly get shorter, thus forming a fringed fin extending to the caudal fin; 5) the tail peduncle is short, the caudal fin is bifurcate, with a convex posterior margin in the median part; 6) the scale covering is limited to the antero-ventral portion of the body. New and more complete specimens will allow to definitely confirm the generic identity, by means of the observation of features such as the presence of a fronto-parietal dermic fenestra, of a posterior parietal process, of a subdivision of the preoperculum, also allowing an efficient comparison with the other species of the genus.

Order Semionotiformes
Family Semionotidae
Genus *Lepidotes* Agassiz, 1832

Lepidotes sp.

This genus is presently represented at the Alburni Mountains by one single specimen lacking the head and the dorsal portion of the body, generally quite disarticulated. The total length of the specimen is approximately 35 cm. The general ascription is based on the features of the scale covering and fins, perfectly corresponding to those of the genus *Lepidotes* Agassiz, 1832.

Order Pycnodontiformes
Fam., Gen. et specie indeterminate

A small Pycnodontiform fish (total length of the head: about 1.5 cm), lacking the posterior half of the body, represents a taxonomic entity which certainly differs from *Coelodus* Heckel, despite the bad state of preservation. The differentiation of the above-mentioned genus is essentially based on the apparent lack of a postparietal process and on the shape of the ventral scutes. The observable features are not enough for a more detailed taxonomic classification.

Order Gonorynchiformes
Family Chanidae
Genus *Prochanos* Bassani, 1879

Prochanos cfr. *rectifrons*

This genus is presently represented by two large-sized specimens, both incomplete and not perfectly preserved. The head (about 8 cm long) and the anterior portion of the body of the first specimen are preserved, in part and counter-part. The second specimen (approximately 65 cm long), in part and counter-part too, lacks the head and is partly disarticulated. These ichthyolytes are easily recognisable as «Chanids» (sensu Patterson, 1984a,b and Maisey, 1991) on the basis of the general morphology of the body, of the structure of the endoskeleton (strength of the vertebral column, number of vertebrae, arrangement of ribs, of neurapophyses, hemapophyses and secondary apophyses), of the position of fins and of the structure and ornamentation of the opercular apparatus and the jaw (hypertrophic operculus, short jaw, not exceeding the anterior margin of the eye socket, lack of teeth). The observable diagnostic features, although relatively scarce for a certain generic and specific diagnosis, allowed to immediately exclude from the comparison the genera *Aethalionopsis* Gaudant, 1966, *Rubiesichthys* Wenz, 1984, *Dastilbe* Jordan, 1910, *Parachanos* Arambourg & Schneegans, 1935 (see Gaudant, 1966, Wenz, 1984, Jordan, 1910 and Arambourg & Schneegans, 1935) and, by means of a direct comparison, the species *Chanos leopoldi* (Costa) of Pietraroia Albian plattenkalk (Benevento, S Italy) (D'Erasmus, 1915).

The biggest affinities seem to exist with the genus *Prochanos* Bassani which only species, *P. rectifrons*, comes from Hvar (Yugoslavia) (Cenomanian-Senonian). Although not perfectly known from an osteological point of view - both for the incompleteness of the specimens and for the age of the description - such species seems to correspond to the specimens of the Alburni Mountains in the general proportions of the body and of the vertebrae, in the number of caudal vertebrae and in their ossification structures, in the morphology and arrangement of hemapophyses and hemospines, of neurapophyses, neurospines and supraneurals, and in the lack of caudal scutes. The studied specimens are therefore ascribed, even though with a few doubts, to *Prochanos rectifrons* Bassani, although the need to review Slavic Chanids and to find new and more complete specimens at the Alburni Mountains is evident.

Order Clupeiformes
Family Clupavidae
Genus *Clupavus* Arambourg, 1950

Clupavus sp.

A few small fishes, generally not longer than 3 cm, generally common in the Petina outcrop, are ascribed to this genus, even though with a few doubts. Their trunk is often curved, because of putrefaction gases that released in the abdominal cavity after the death. The general shape is that of a primitive clupeiform, superficially similar to that of a whole series of small Cretaceous ichthyolytes, common in Italian and foreign outcrops, often previously ascribed to the genus *Leptolepis* (see for example «*Leptolepis brodiei*» of Pietraroia (D'Erasmus, 1915); «*Leptolepis neocomiensis*» of Lesina (Bassani, 1882); «*Leptolepis checchii*» (D'Erasmus, 1946), etc.) and subse-

quently compared in certain cases to the genus *Clupavus* Arambourg (Arambourg, 1950) or, after the works by Nybelin (1974), Taverne (1975) and Patterson & Rosen (1977), linked or excluded from the family Leptolepididae sensu strictu (Nybelin). The final taxonomic classification of these forms and therefore of the Alburni Mountains specimens will require a long and complex general revision.

Other indeterminate ichthyolytic finds

Other remains of very incomplete fishes have been found in the outcrop. Part of them can probably be ascribed to Gonorynchiforms.

After this short preliminary description of the faunistic and floristic assemblage of Petina, the carcinologic sample of this outcrop is studied into details.

Preservation modalities and materials

The examined sample consists of seven specimens of decapod crustaceans, six of which are macruran and one is brachyuran. Four of these specimens are preserved as part and counter-part. The specimens are preserved in light-brown thin layers of lithographic limestone, flattened on the layer surface. The soft consistency of the surrounding rock makes their preparation easy.

After a careful examination, three specimens have been ascribed to the new genus *Alburnia* with the new species *A. petinensis*. The state of preservation of the other specimens makes their sure systematic attribution difficult, not at a generic level, but at a specific level: in fact, three specimens were only ascribed to the genus *Palinurus* Weber, 1795. Finally the only specimens of brachyuran decapod crustacean has been ascribed to the family Portunidae Rafinesque, 1815 (genus and species indeterminate).

The study of decapod crustaceans of the Lower Cretaceous of Petina (Alburni Mountains, Salerno - S Italy) is part of a research programme on lithographic limestones of Campania that the Palaeontology Department of the Università di Napoli has been carrying out for many years; moreover, this study is part of a research programme on Mesozoic macruran decapod crustaceans that the Invertebrate Palaeontology Department of the Museo di Storia Naturale di Milano has been carrying out for many years on materials from its own and other Museums' collections. Up to now this programme brought to the description of important Italian and foreign Mesozoic faunistic assemblages, such as the Triassic association of the Ambilobè region (NW Madagascar) (Garassino & Teruzzi, 1995), of Cene (Seriana Valley, Bergamo - N Italy) (Pinna, 1974), of Prati di Rest (Valvestino, Brescia - N Italy) (Pinna, 1976), of Ponte Giurino (Imagna Valley, Bergamo - N Italy) (Garassino & Teruzzi, 1993) and of Carnia (Udine, NE Italy) (Garassino, Teruzzi & Dalla Vecchia, 1996); the Lower Jurassic fauna of Osteno (Lugano Lake, Como - N Italy) (Pinna, 1968, 1969, Garassino & Teruzzi, 1990, Teruzzi, 1990 and Garassino, 1996) and the Cretaceous assemblages of Trebiciano (Trieste, NE Italy) (Garassino & Ferrari, 1992), of the Lebanese outcrops (Garassino, 1994), of Vernasso (Udine, NE Italy) (Garassino & Teruzzi, 1995), of Las Hoyas (Cuenca, Spain) (Garassino, 1997), of Pietraroia

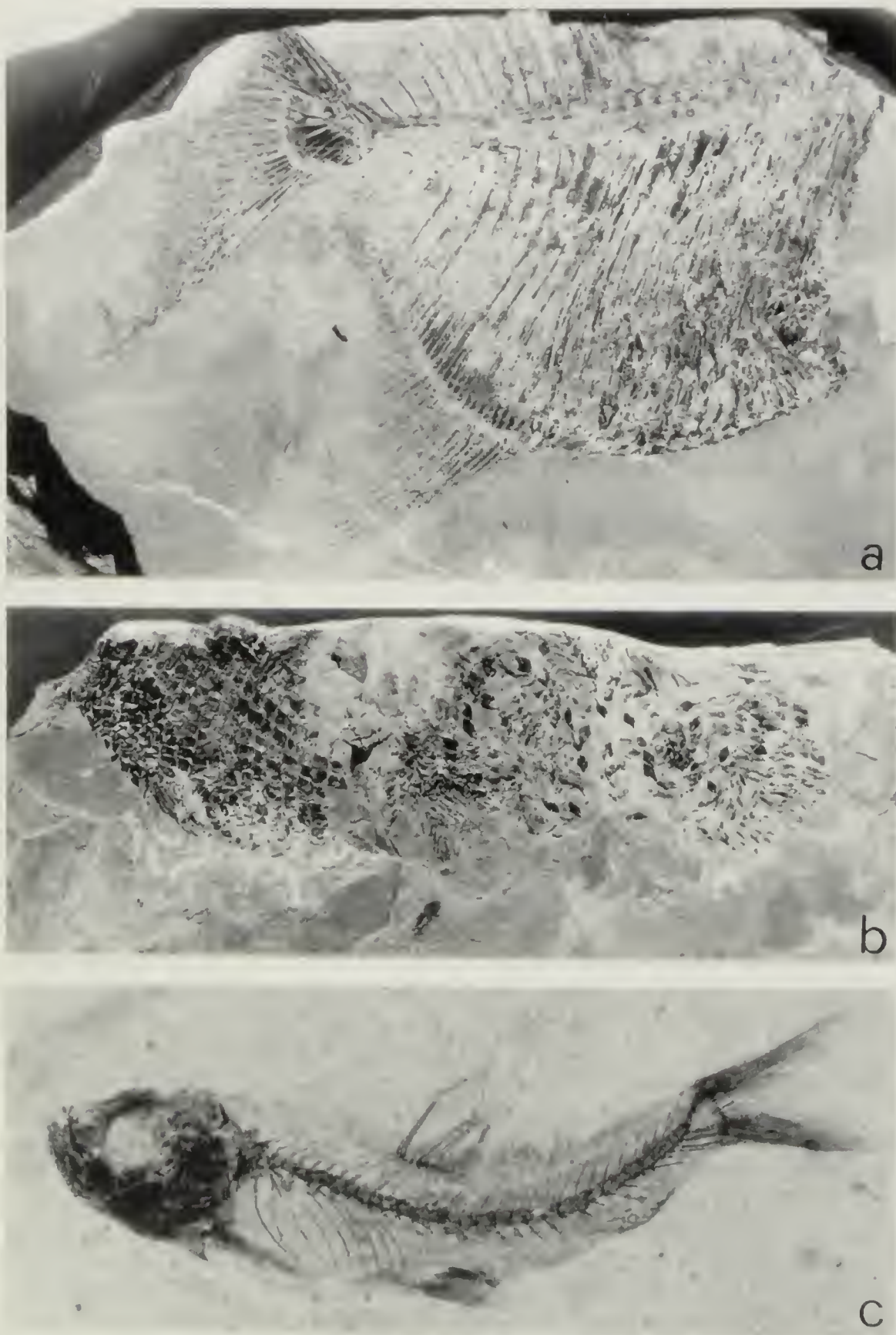


Fig. 10 – a) *Coelodus* sp., M21842 (x0.8); b) *Lepidotes* sp., M.21843 (x0.4); c) *Chupavus* sp., M21841 (x5). Petina Plattenkalk, Middle Albian.

(Benevento, S Italy) (Bravi & Garassino, 1997) and of Torrente Cornappo Valley (Udine, NE Italy) (Garassino 1997).

Acronym. M: Museo di Paleontologia di Napoli

Abbreviations

R - rostrum

E - eye

Systematics

Infraorder Caridea Dana, 1852

Family Palaemonidae Rafinesque, 1815

Genus *Alburnia* nov.

Diagnosis: Subrectangular carapace; long rostrum with 10 suprarostal teeth and one subrostral tooth in the anterior third; somite II with subround pleura partly overlapping that of somite I and III; pereopods I-II chelate with merus and carpus strongly elongate; exopodite with diaeresis.

Derivatio nominis: from Alburni Mountains.

Type species: *Alburnia petinensis* n.sp.

Description: as for the type species.

Alburnia petinensis n.sp.

Figs. 11,12,13

Derivatio nominis: from Petina, the village where the examined specimens were discovered.

Holotype: M21834.

Paratype: M21835.

Type locality: Petina (Alburni Mountains, Salerno - S Italy).

Geological age: Middle Albian (Lower Cretaceous).

Diagnosis: as for the genus.

Materials: 3 small-sized specimens, in lateral view and in good state of preservation.

M: 21834, 21835, 21836.

Description. It is a small-sized caridean with thin and completely smooth exoskeleton, 1.5 cm in length.

Carapace. In lateral view the carapace (Fig. 11) has a subrectangular shape and gets slightly narrow toward the anterior margin for the slight curvature of the ventral margin. The dorsal margin is straight, while the posterior margin, strengthened by a thin marginal carina, has a slight concavity in the lower third. The dorsal margin extends into a long rostrum with pointed distal extremity, bearing 10 identical and forwards protruded suprarostal teeth and 1 subrostral tooth in the anterior third. The ocular incision is narrow and shallow and the antennal and pterygostomial angles are not very marked. No traces of grooves, carinae and spines can be observed on the surface of the carapace.

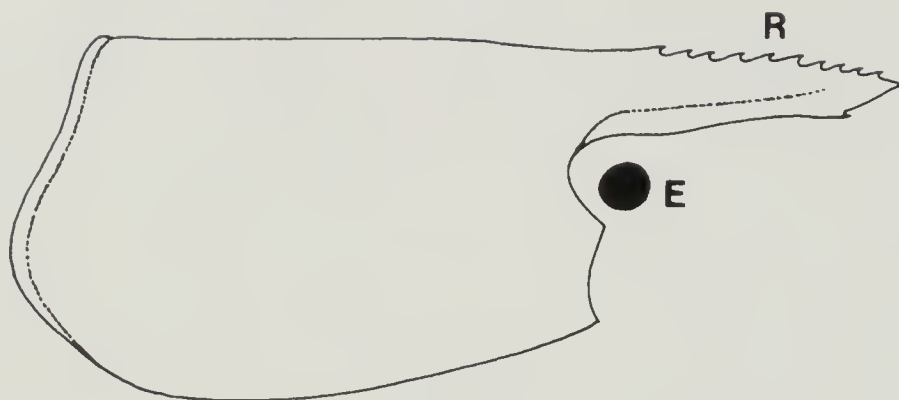


Fig. 11 – *Alburnia petinensis* n.gen.n.sp., reconstruction of carapace in lateral view, line drawing.

Abdomen. The somites have a subrectangular shape and rounded lower margin. Somite II has a subround pleura partly overlapping that of somites I and III. The posterior margin of somites III-V is sinuous. Somite VI, slightly longer than the others, has a subrectangular shape. The telson has a triangular shape and pointed distal extremity. The uropods are about 1/3 longer than the telson. The exopodite shows a thin marginal carina converging in the lower third, thus creating a little spine by the upper margin of the subround diaeresis, visible only in one specimen (M21836). The endopodite lacks any ornamentation.

Cephalic appendages. Well preserved in all specimens. The eye is supported by a short eye-stalk. The antennulae consist of three articuli: the 1st is thin and elongate, while the 2nd and the 3rd are short and stocky. The antennular flagella are very elongate. The scaphocerite has a laminar shape and pointed distal extremity. A flagellum, as long as the body, is articulated to the carapocerite of the antennae.

Thoracic appendages. They are well preserved only in two specimens (M21834, M21835). The 3rd maxilliped is not preserved. The merus and carpus of the chelate pereopods I-II are strongly elongate. The distal extremity of the carpus articulating to the propodus is slightly swollen. The propodus of the chela is elongate, with dactylus and index curved and with the same length. Pereopods III-V have a terminal dactylus and show a markedly elongate propodus.

Abdominal appendages. They are visible only in two specimens (M21834, M21835). The pleopods consist of a subrectangular sympodite to which two elongate multiarticulate flagella are articulated.

Observations

Carideans are very rare in the fossil record and their morphological features are not well known because of their poor state of preservation.

The most ancient genera known to date, *Acanthinopus* Pinna, 1974 and *Leiothorax* Pinna, 1974, were discovered in the Calcare di Zorzino (Norian, Upper Triassic) of Bergamo Prealps (Cene, Seriana Valley - Bergamo, N Italy) (Pinna, 1974). Another form, *Pinnacaris* Garassino & Teruzzi, 1993, was described in the Argilliti di Riva di Solto (Sevastian, Upper Norian-



Fig. 12 – *Alburnia petinensis* n.gen.n.sp., reconstruction.

Lower Rhaetian, Upper Triassic - according to the authors) of Ponte Giurino (Imagna Valley - Bergamo, N Italy) (Garassino & Teruzzi, 1993).

Glaessner (1969) ascribed to Jurassic only the genus *Udorella* Oppel, 1862 (family Udorellidae Van Straelen, 1924). The same author ascribed also three *incertae sedis* Jurassic genera to carideans: *Blaculla* Münster, 1839, *Hefriga* Münster, 1839 and *Udora* Münster, 1839.

We presently know four species of Cretaceous carideans.

Martins-Neto & Mezzalana (1991a) found a few specimens of carideans in the Crato Member of Santana Formation (Lower Cretaceous) of Brazil. The perfect state of preservation of these specimens allowed the authors to describe the new genus *Beurlenia* (family Palaemonidae Rafinesque, 1815) with the species *B. araripensis*.

Roger (1946) described the new species *Notostomus cretaceus* on a sample of five specimens found in the Santonian (Upper Cretaceous) of Sahel Alma (Lebanon). This species was the subject of a recent review by Garassino (1994), who ascribed the species by Roger to the new genus *Odontochelion* (family Oplophoridae Dana, 1852).

Rabadà (1993) described the new genus *Delclosia* with the species *D. martinelli* on a sample of 60 specimens of the Lower Barremian (Lower Cretaceous) of Las Hoyas (Cuenca, Spain). This genus was the subject of a recent review by Garassino (Garassino, 1997).

Garassino & Bravi (in 1997) recently described the new genus *Parvocaris* with the species *P. samnitica* (indeterminate family) on a sample of 14 specimens of the Lower Albian (Lower Cretaceous) of Pietraroia (Benevento, S Italy).

Garassino & Ferrari (1992) reported the presence of only one specimen of caridean in the Senonian (Upper Cretaceous) of Trebiciano (Trieste, NE Italy) without ascribing it to a known family, genus and species. Garassino & Teruzzi (1995) recently reported the probable presence of a new caridean form in the Upper Hauterivian-Lower Barremian (Lower Cretaceous) of Vernasso (Udine, NE Italy).

Only four genera of carideans are presently known in the Tertiary deposits.

Four species belong to the genus *Bechleja* Hořsa, 1956, a typical form of freshwater deposits: *B. rostrata* Feldmann et alii, 1981 from the Eocene of the Green River Formation (Wyoming, USA); *B. inopinata* Hořsa, 1956 from the Oligocene of the Czechoslovakia; *B. bahiaensis* (Beurlen, 1950) and *B. robusta* Martins-Neto & Mezzalira, 1991 from the Oligocene of Brazil (Beurlen, 1950, Hořsa, 1956, Feldmann et alii, 1981, Martins-Neto & Mezzalira, 1991b).

In the Miocene deposits of N Caucasus (Russia) the three genera *Palaemon* Weber, 1795, *Pasiphaea* Savigny, 1816 and *Bannikovia* Garassino & Teruzzi, 1996 have been described with the species *P. mortuus* Smirnov, 1929, *P. mortua* Smirnov, 1929 and *B. maikopensis* Garassino & Teruzzi, 1996 respectively (Smirnov, 1929, Garassino & Teruzzi, 1996).

Patricelli et alii (in press) recently ascribed a sample of over 40 complete and fragmentary specimens to the new species *Palaemon vesolensis* (family Palaemonidae Rafinesque, 1815), found in the Upper Cretaceous deposits of Mount Vesole (Salerno, S Italy).

On the grounds of what described, *Alburnia petinensis* n.sp. and *Parvocaris samnitica* n.sp. therefore represent the only two forms of Italian Cretaceous carideans known to date. Moreover, *A. petinensis* n.sp. is one of the few fossil species of carideans known to date that can be ascribed with certainty to a known family by some definite characters. In fact the study of this species has pointed out some characters, such as the rostrum with many suprarostal teeth and one subrostral tooth, pereopods I-II with merus and carpus strongly elongate and pereopod II with a chela stronger and longer than that of pereopod I. These characters allow to ascribe *A. petinensis* n.sp. to the family Palaemonidae Rafinesque, 1815, thus representing the most ancient species belonging to this family, known only in Palaeocene and Miocene deposits until present.

Even though *A. petinensis* n.sp. and *P. samnitica* n.sp. are more or less coeval, two characters of the species of Alburni Mountains, such as the rostrum with many suprarostal teeth and one subrostral tooth and pereopods I-II with merus and carpus strongly elongate, clearly distinguish it from Pietraroia species (see paper in the same volume).

Infraorder Palinura Latreille, 1803
Superfamily Palinuroidea Latreille, 1803
Family Palinuridae Latreille, 1802
Genus *Palinurus* Weber, 1795

Palinurus sp.
Fig. 14

Materials: 3 specimens preserved in part and counter-part and in bad state of preservation. Two specimens are in dorsal view and one in dorso-lateral view. Even though the total length of the specimens cannot be assessed because of their incompleteness, the relative length is between 4 and 5 cm.

M: 21837, 21838, 21839.

The bad state of preservation of the examined specimens has not allowed a detailed morphological description, limited only to some characters.

The carapace, partially preserved in only one specimen (M21837), has a subrectangular shape and the posterior margin, slightly anteriorly arcuate, is strengthened by a thin marginal carina. The cervical groove is deep. The first three abdominal somites with a subrectangular shape and uniform length are observed in two specimens (M21837, M21838). The exopodite with markedly fringed lateral margins is observed in specimen M21837. The antennulae consist of three thin and elongate articula, while the short and stocky merocerite and carpocerite of the antennae are preserved. A flagellum, as long as the body, is articulated to the carpocerite. The scaphocerite has a laminar shape. Pereiopod I with short and stocky propodus and pereopods II-V with thin and elongate propodus are observed in two specimens (M21837, M21838). The surface of pereopods is finely tuberculate.

Observations

In spite of the bad state of preservation of the examined specimens, it has been possible to observe some characters, such as the subrectangular carapace, the deep cervical groove and the two thin divergent longitudinal carinae of the posterior margin. These characters have allowed to ascribe the examined specimens to the genus *Palinurus* Weber, 1795. However, the bad state of preservation has not allowed the specific ascription of the examined specimens.

The genus *Palinurus* Weber, 1795 is known starting from the Upper Cretaceous: in the Turonian of Boemia with the species *P. woodwardi* Fritsch, 1887, in the Cenomanian of Hakel (Lebanon) with *Palinurus* sp. and in the Senonian of Germany with the species *P. baumbergicus* Schlüter, 1862. *P. desmaresti* de Zigno, 1915 is the only Tertiary species known to date found in the Lutetian (Middle Eocene) of Veneto.

On the grounds of what described, the discovery of the genus *Palinurus* Weber, 1795 in Petina would therefore represent the first report on this genus in the Cretaceous deposits of Italy.

Even though the state of preservation of the species known to date is not good, it has been possible to point out a certain morphological affinity with the discovery of the genus *Palinurus* Weber, 1795 in the Cenomanian of Hakel (Lebanon), by some characters observed in the examined specimens, such as the cephalic appendages and pereiopod I shorter than the others.

The genus *Palinurus* Weber, 1795 is presently represented by the species *P. longimanus*, *P. truncatus* and *P. vulgaris*, geographically limited to the Atlantic Ocean, and by the species *P. gilchristi*, limited to the SE Coast of South Africa (George & Main, 1967).

Superfamily Portunoidea Rafinesque, 1815

Family Portunidae Rafinesque, 1815

Gen. et sp. indet.

Fig. 15

Materials: 1 specimen in dorsal view, in bad state of preservation and 1.5 cm in length.

M21840.

The morphological characters observed in this specimen have not allowed either a careful study or a certain generic and specific ascription.

The ascription to the family Portunidae Rafinesque, 1815 was made possible by the identification of two typical characters of this family: the hexagonal or square carapace, generally larger than long, and pereopod V with paddle-like propodus and dactylus for swimming.

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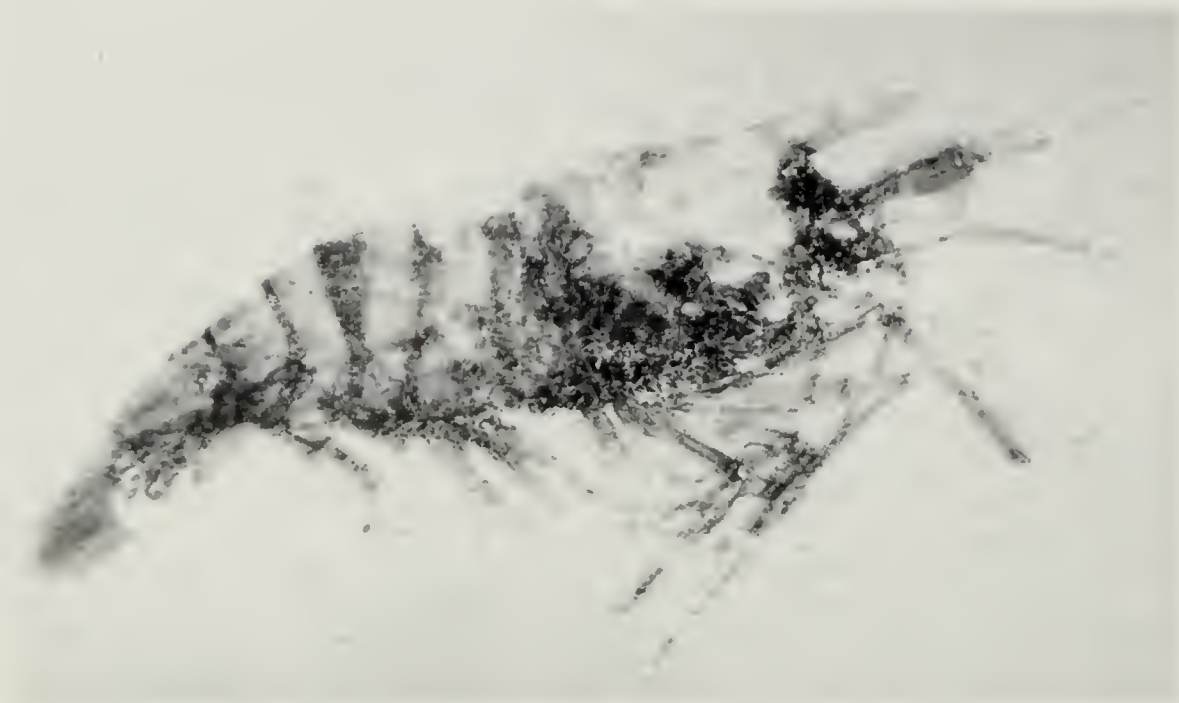


Fig. 14 – *Alburnia petinensis* n.gen.n.sp., holotype, n. cat. M21834, photo and reconstruction (x6.5).

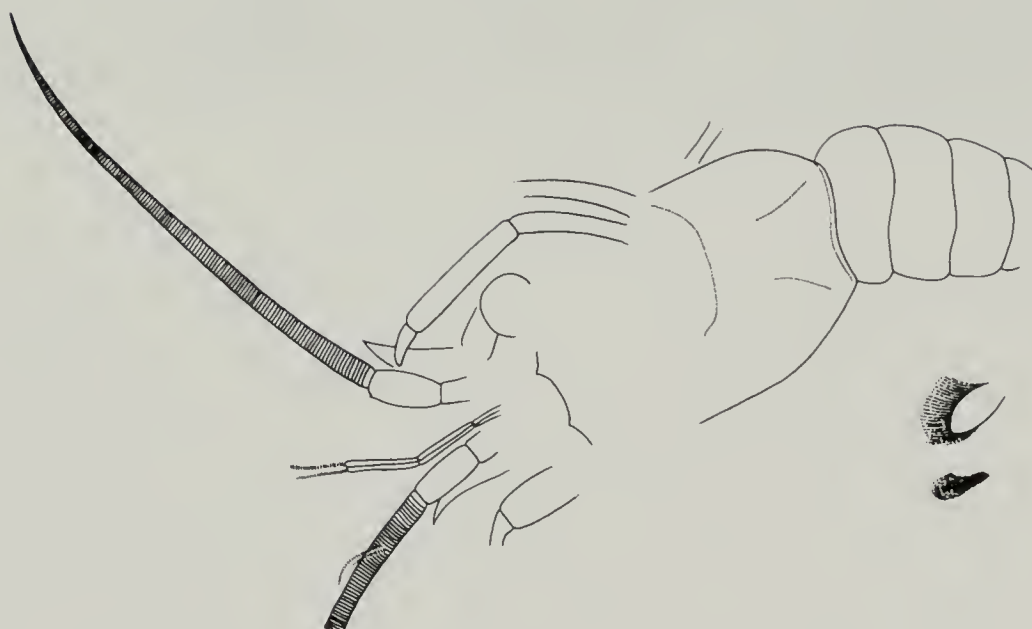
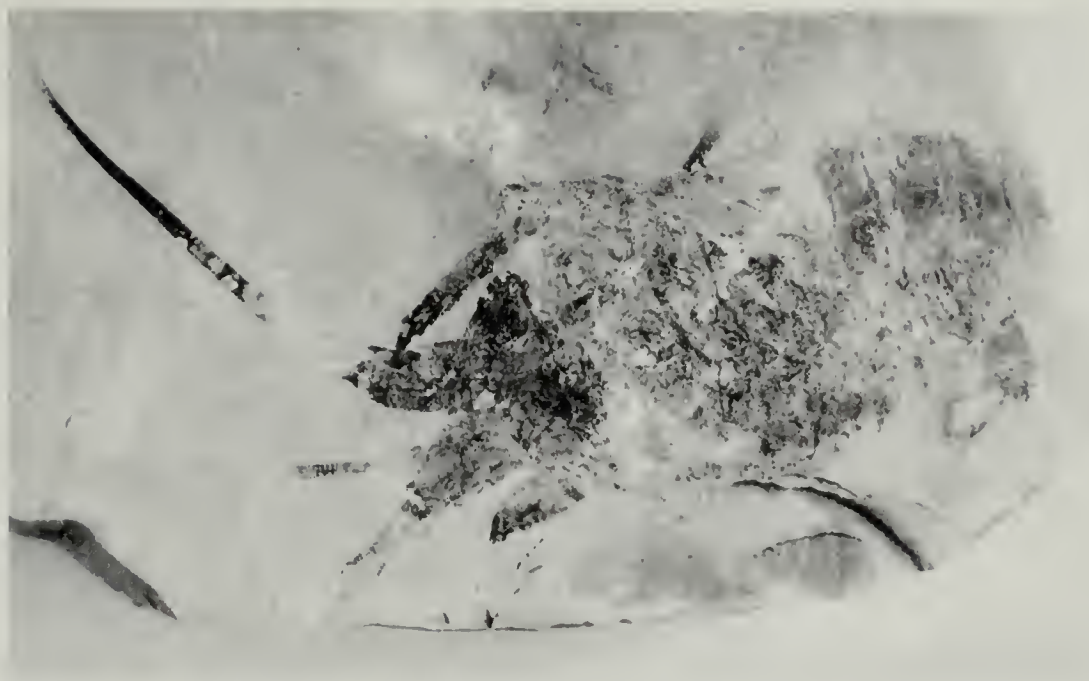


Fig. 15 – *Palinurus* sp., n.cat. M21837, photo and reconstruction (natural size).

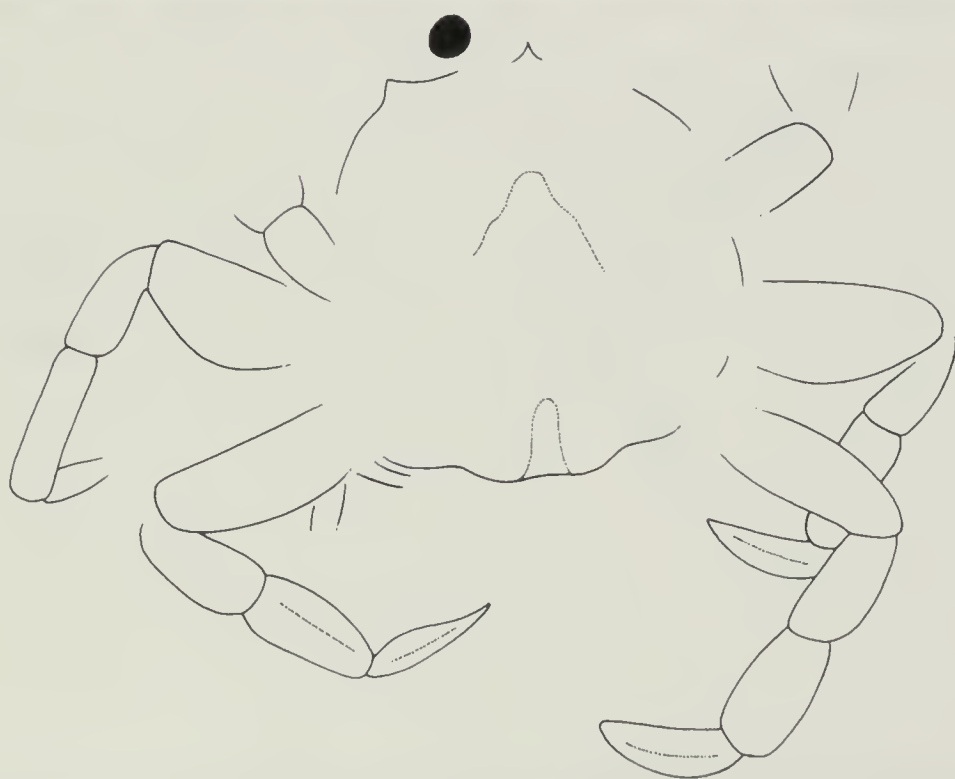
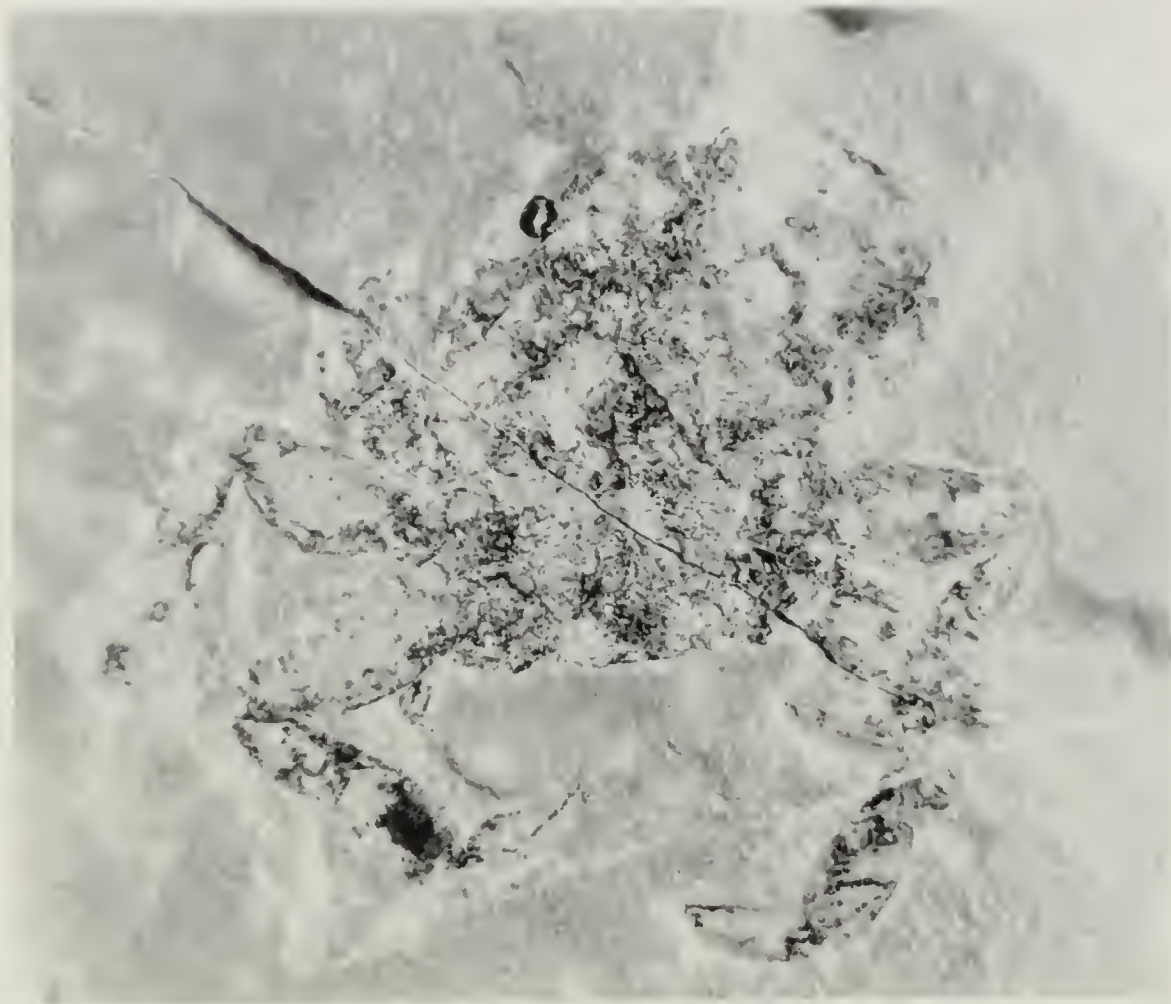


Fig. 16 – Family Portunidae Rafinesque, 1815, n. cat. M21840, photo and reconstruction (x3).